A VEGETATION ANALYSIS OF THE GEORGIA FALL-LINE SANDHILLS

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Extending along the physiographic fall-line from central North Carolina to Alabama is a narrow belt of intermittent ridges and hills. These hills, which are made up of whitish or yellowish sands, are called the fall-line sandhills. The sandhills form an important physiographic feature through Georgia, South Carolina, and into North Carolina (Austin, 1965). The sandy ridges are higher than both the Coastal Plain on one side and the Piedmont region on the other side; elevation ranges from 30 to 50 feet (Hopkins & Hebb, 1954). The depth of the nearly pure sand is unknown, but it effectively protects the underlying clay or rocks from erosion. Soil permeability and internal drainage are rapid, and moisture retention for plant use is low (Burns & Hebb, 1972).

The vegetation of the xeric sandhills was once predominantly longleaf pine (Wells & Shunk, 1931). However, the lumber industry of the early 1900's removed most of the stands of longleaf pine and the understory scrub oaks assumed dominance because they adapted well to the droughty, acid sands (Burns & Hebb, 1972). Harper (1906), in his phytogeographical investigation of the Altamaha Grit region of the Coastal Plain of Georgia, included a brief discussion of the sandhills and a checklist of plants from different sandhill areas. He found *Quercus laevis* Walt. to be the dominant scrub oak and *Eriogonum tomentosum* Michx. the most abundant herb. An ecological study of the coarser sands of the North Carolina Coastal Plain was made by Wells and Shunk (1931). They reported on the vegetation and habitat factors and suggested that the flora of the sandhills is probably determined by nutrient and water factors and their relationship to root growth. Alien roots must grow rapidly through the relatively sterile sands to reach richer, moister

layers below. The Florida sandhills are covered by a longleaf pine-turkey oak association that forms open, park-like stands with abundant herbaceous ground-cover composed mostly of wire-grasses (Laessle, 1958). Duke (1961) made a floristic study of the Carolina fall-line sandhills and enumerated the xerophytic elements of the sandhill flora.

The objectives of this study were to determine the composition of the longleaf pine-scrub oak stands in the western portion of Georgia and to observe the ecology of the area.

DESCRIPTION OF THE STUDY AREA

The fall-line in Georgia runs through the central part of the state from Columbus, through Macon, to Augusta. The sandhills are very prevalent along the western portion of the fall-line east of Columbus in Talbot County. Numerous xeric, sandy ridges with unusual vegetation occur around Junction City, a small, rural community in Talbot County.

The sandhills selected for study are located between Geneva and Junction City along highway 80, and south of Junction City along highway 90. The high, dry hills with longleaf pine-scrub oak vegetation are common along both sides of the highways for many miles. The width of the sandhill belt is variable. Around Junction City, however, it seems to be about 20 miles wide. The longleaf pine-scrub oak stands are bordered on the north and south by loblolly-shortleaf pine stands and mixed pine-hardwood forests. As the vegetation of the sandhills changes to the pine and pine-hardwood stands, there is a noticeable difference in elevation and soil type as well.

The soils of the fall-line sandhills are acid in reaction and infertile. Results from this investigation indicate a soil pH range of 4.0-5.6. Brendemuehl (1967) reported that the pH of the sandhills ranged from 4.2-5.6, and the amount of organic matter was less than 2.0 per cent. The organic matter present on the surface of the sands oxidizes

quickly and released nutrients are leached from the upper strata by rain (Burns & Hebb, 1972). The soils also contain less than 10 per cent silt and clay. The loose, sandy soils produce much heat by reradiation; this affects micro-atmospheric temperature and a concomitant increase in evapotranspiration of surface moisture is likely. The sub-surface temperatures of soils are kept low by the reradiation of heat and this tends to conserve available water.

METHODS

The vegetation of the sandhills was analyzed by the quarter method of Cottam and Curtis (1956). After general reconnaissance in the study area, two representative sites were selected for intensive study. A total of 50 points (25 at each site) was sampled. Trees over four inches d.b.h. and saplings under four inches d.b.h. were scored, and shrubs and herbs were collected within the study area several times during the growing season. Tree seedlings at each sample point were identified to ascertain possible successional trends. A LaMotte soil test kit was used to check soil samples for pH. Voucher specimens were collected and deposited in the Columbus College Herbarium.

RESULTS

Information obtained by the quarter method of sampling is presented in Table 1 and the categories of Cottam and Curtis (1956) are used. The number of trees over four inches d.b.h. and the number of saplings under four inches d.b.h. are shown along with the following values for the trees and saplings: relative density, relative dominance, relative frequency, and importance values. The sandhill vegetation is dominated by turkey oak (*Quercus laevis*). Of the 200 trees scored, 175 were turkey oak, and of the 200 saplings scored, 159 were turkey oak. The importance values for turkey oak trees and saplings are 239.6 and 220.2 respectively out of a possible 300. Scrubby post oak (*Q. margaretta* Ashe) and bluejack oak (*Q. incana* Bartr.) are species of secondary importance. Of the 200 trees

TABLE 1. Importance Values of Trees and Saplings on the Sandhills in Talbot County, Georgia

	Number		*Relative Density*		*Relative Dominance*		*Relative Frequency*		*Importance Values*	
	Trees	Saplings	Trees	Saplings	Trees	Saplings	Trees	Saplings	Trees	Saplings
Quercus laevis	175	159	87.5	79.5	83.6	82.6	68.5	58.1	239.6	220.2
Quercus margaretta	12	10	6.0	5.0	5.5	5.1	13.7	11.0	25.2	21.1
Quercus incana	1	24	0.5	12.0	1.2	9.4	1.4	22.7	3.1	44.1
Quercus marilandica	2	0	1.0	0.0	0.9	0.0	2.7	0.0	4.6	0.0
Pinus palustris	6	0	3.0	0.0	6.9	0.0	8.2	0.0	18.1	0.0
Nyssa sylvatica	2	5	1.0	2.5	0.9	2.6	2.7	5.8	4.6	10.9
Diospyros virginiana	2	1	1.0	0.5	0.9	0.1	2.7	1.2	4.6	1.8
Pinus taeda	0	1	0.0	0.5	0.0	0.3	0.0	1.2	0.0	2.0

sampled, only six were longleaf pine (*Pinus palustris* Mill.) ; no longleaf pine saplings were scored in the quarter method. However, longleaf pine seedlings and saplings were observed along the edges of the scrub oak stands and in the areas where the oak canopy had been disturbed. *Nyssa sylvatica* Marsh. and *Diospyros virginiana* L. are broad-leaved taxa of lesser importance.

The shrubs associated with the scrub oak stands are numerous. The most abundant species are: *Asimina parviflora* (Michx.) Dunal, *Cornus florida* L., *Crataegus flava* Aiton, *C. uniflora* Muenchh., *Gaylussacia dumosa* (Andrz.) T. & G., *Myrica cerifera* L., *Prunus angustifolia* Marsh., *P. serotina* Ehrhart, *Rhus copallina* L., *R. toxicodendron* L., *Rubus cuneifolius* Pursh, *Sassafras albidum* (Nutt.) Nees, *Vaccinium arboreum* Marsh., *V. stamineum* L., and *V. tenellum* Aiton. Species of *Crataegus*, *Vaccinium*, and *Rhus* are the most common. *Myrica cerifera* is not as common on the sandhills as it is in the adjacent loblolly-shortleaf pine forests; it is found only in open areas that are lower and more mesic than the high, dry sites.

Herbaceous plants are present on the sandhills, but are not especially numerous. Duke (1961) stated that the grasses, composites, and legumes were the best represented groups on the xeric, sandy ridges. Species noted within these families include *Aristida stricta* Michx., *Andropogon scoparius* Michx., *A. ternarius* Michx., *A. virginicus* L., *Panicum* spp., *Erigeron strigosus* Michx. ex Willd., *E. canadensis* L., *Krigia virginica* (L.) Willd., *Liatris secunda* Ell., *L. tenuifolia* Nutt., *Vernonia angustifolia* Michx., *Baptisia cinerea* (Raf.) Fernald & Schubert., *B. perfoliata* (L.) R. Brown, *B. tinctoria* (L.) R. Brown, *Lespedeza* spp., and *Tephrosia virginiana* (L.) Pers. Other common xerophytic herbs are *Yucca filamentosa* L., *Asclepias humistrata* Walt., *Cnidoscolus stimulosus* (Michx.) Engelm. and Gray, and *Lithospermum caroliniense* (J. F. Gmelin) MacM. Ferns present include *Asplenium platyneuron* (L.) Oakes, *Polystichum acrostichoides* (Michx.) Schott, and *Pteridium aquilinum* (L.) Kuhn.

DISCUSSION

The vegetation of the Georgia fall-line sandhills is much like that of the turkey oak barrens of the Carolinas described by Duke (1961). In Talbot County, turkey oak dominates the vegetation and longleaf pine persists along the edges of the stands and in open areas. The scattered longleaf pines are reproducing by seed as evidenced by the number of young seedlings and saplings present, but the almost complete occupation by scrub oaks has prevented their re-establishment. The dense root systems of the scrub oaks and woody shrubs prevent the development of longleaf pine roots, while the diminished quality of light reaching the ground through the canopy of oaks and shrubs retards the growth of longleaf pine seedlings. The exclusion of fire on the sandhills has also added to the decline of longleaf pine.

In the Carolinas, the presence of *Quercus incana*, *Q. margaretta*, and *Q. marilandica* indicate more mesic forest conditions than does dominance by *Q. laevis* (Duke, 1961). The turkey oak stands in the western portion of Georgia, therefore, suggest more xeric conditions than the Carolina sandhills and a greater similarity to the Florida scrub oak areas. The number of turkey oak saplings indicates the species will maintain its dominance and not be replaced by the more mesophytic oaks.

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